



U.S. Department
of Transportation

Federal Aviation
Administration

Advisory Circular

Subject: SPECIFICATION FOR
PORTABLE RUNWAY
AND TAXIWAY LIGHTS

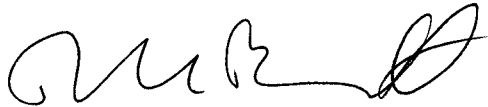
Date: 19 September 2005
Initiated by: AAS-100

AC No.: 150/5345-50A
Change:

- 1. PURPOSE.** This advisory circular (AC) contains the Federal Aviation Administration (FAA) standards for portable runway and taxiway lights and runway end identifier lights for temporary use to permit continued aircraft operations while all or part of a runway lighting system is inoperative.
- 2. CANCELLATION.** AC 150/5345-50, *Specification for Portable Runway Lights*, dated October 16, 1978, is cancelled.
- 3. PRINCIPAL CHANGES.** The following principal changes have been incorporated into this AC:
 - a. The L-864, Flashing Clear Runway End Identifier Light, is renumbered to L-863E because of a conflict with the L-864, Flashing Red Obstruction Light (20 - 40 FPM).
 - b. The L-863C is renamed to L-863W for the color of the light instead of the lens.
 - c. The photometric requirements for the steady burning lights are now in tabular format and are made more performance oriented.
 - d. The battery operating time is lowered to allow manufacturers to produce equipment of a size and weight that is portable.
 - e. Battery recharge requirements are added because of the reduced operating times.
 - f. Solar recharging is now permitted.
 - g. The qualification procedures are revised in response to the new Airfield Lighting Equipment Certification Program.
 - h. Alternative lighting devices that consume less energy have been added.
 - i. Radio controlled devices are now optional.
- 4. CRITERIA FOR USE OF PORTABLE LIGHTS.** The portable lights are for use only on a temporary basis and are not suitable for permanent use. They are intended primarily for visual flight rules (VFR) operations. Where the portable edge lights are used to identify the runway threshold, they should be supplemented with the portable runway end identifier lights to improve runway end definition. The portable lights must be securely anchored to withstand wind, wake vortices, and propeller/jet blasts.

5. APPLICATION. The standards contained herein are recommended by the FAA in all applications involving airport development of this nature. The use of these standards is mandatory for airport projects receiving Federal funds under the airport grant assistance program and the passenger facility charge (PFC) program.

6. METRIC UNITS. To promote an orderly transition to metric units, this AC includes both English and metric dimensions. The metric conversions may not be exact equivalents and, until there is an official changeover to the metric system, the English dimensions will govern.

A handwritten signature in black ink, appearing to read 'DLB', with a stylized flourish at the end.

David L. Bennett
Director of Airport Safety and Standards

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1. SCOPE AND CLASSIFICATION.

1.1 Scope. This specification details the requirements for portable, battery-powered light units to be used to identify and delineate airport runways and taxiways on a temporary basis.

1.2 Equipment Classification.

1.2.1 Type. The following types of light units are covered by this specification:

Type	Horizontal Beam Coverage	Description
L-863W	360°	Steady-burning, omni-directional white runway edge light
L-863W/Y	180° ($\pm 5^\circ$)	Steady-burning, bi-directional white/yellow runway edge light
L-863R/G	180° ($\pm 5^\circ$)	Steady-burning, bi-directional red/green threshold/runway end light
L-863B	360°	Steady-burning, omni-directional blue taxiway edge light
L-863Y	360°	Steady-burning, omni-directional yellow edge light
L-863R	360°	Steady-burning, omni-directional red runway end light
L-863G	360°	Steady-burning, omni-directional green threshold light
L-863E	360°	Flashing, omni-directional white runway end identifier light

2. REFERENCED DOCUMENTS.

2.1 Federal Aviation Administration Publications.

AC 150/5345-53	<i>Airport Lighting Equipment Certification Program.</i>
AC 150/5345-43	<i>Specification for Obstruction Lighting Equipment.</i>
Eng. Brief No. 67	<i>Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures (November 2004).</i>
HF-STD-001	<i>Human Factors Design Standard.</i>

Electronic copies of FAA Documents may be obtained from:

www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/

or by standard mail from:

U.S. Department of Transportation
Subsequent Distribution Office
Ardmore East Business Center
3341Q 75th Avenue
Landover, MD 20785

Phone: (301) 322-4961
FAX: (301) 386-5394

2.2 Military Publications.

MIL-C-7989B	<i>Cover, Light-Transmitting, for Aeronautical Lights, General Specification For, (Amendment 2, dated 8 September 1982).</i>
MIL-STD-810F	<i>Environmental Engineering Considerations and Laboratory Tests.</i>

Copies of Military Standards may be obtained from:

<http://www.dodssp.daps.mil/>

or compact discs (CDs) on website order form by standard mail from:

DAPS / DODSSP
Building 4/Section D
700 Robbins Ave.
Philadelphia, PA 19111-5094

2.3 Illuminating Engineering Society (IES) Publication.

LM-35-02	<i>Photometric Testing of Floodlights Using High Intensity Discharge or Incandescent Filament Lamps.</i>
IES Handbook	<i>1993 Reference and Application Volume, 8th Edition</i>

Copies of IES documents may be obtained from:

<http://www.iesna.org/>

or by standard mail from:

Illuminating Engineering Society
120 Wall Street
17th Floor
New York, New York 10002

2.4 International Civil Aviation Organization (ICAO).

Annex 14	<i>Volume 1, Aerodrome Design and Operations.</i>
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Copies of ICAO Standards are available from:

<http://www.icao.int>

or by standard mail at:

ICAO, Document Sales Unit
999 University Street, Montreal, Quebec H3C 5H7, Canada
Phone: + 1 (514) 954-8022
FAX: + 1 (514) 954-6769
E-mail: sales@icao.int

2.5 Federal Communications Commission.

47 CFR part 15 *Telecommunication, part 15, Radio Frequency Devices*

Copies of 47 CFR part 15 are available from:

<http://www.gpoaccess.gov/cfr/index.html>

or by standard mail at:

U.S. Government Printing Office
710 N. Capitol Street, NW
Washington, DC 20401

Phone: (202) 512-0132

FAX: (202) 512-1355

3. REQUIREMENTS.

3.1 Equipment to be Supplied.

Each light unit must be complete per all specification requirements and must include instruction sheets (paragraph 3.9). At the option of the purchaser, light units may be supplied without batteries or anchors.

3.2 Environmental Conditions.

The light units and battery must perform under the following environmental conditions:

3.2.1 Temperature.

Exposure to any temperature from -4°F to +122°F (-20°C to +50°C).

3.2.2 Wind.

Exposure to wind speeds up to 150 mph (240 km/h) from any direction.

3.2.3 Salt Spray (If metallic materials are used).

Exposure to a salt-laden atmosphere.

3.2.4 Sunshine (If plastic materials are used).

Exposure to solar radiation.

3.2.5 Weather.

Exposure to all normal weather conditions including exposure to blowing dirt and sand (up to 150 mph), rain, snow, ice, sleet, and hail.

3.3 Photometric Requirements.

3.3.1 L-863W, L-863W/Y, L-863R/G, L-863Y, L-863R, L-863G, and L-863B Light Units.

- The photometric performance of each unit is defined in Table 1.
- Each measurement taken per paragraph 4.3.2 must equal or exceed the intensity specified in Table 1.
- The light color must be equivalent to the aviation color chromaticities as defined by the International Commission on Illumination (CIE) boundary equations which can be referenced in ICAO Annex 14, Volume 1.

Table 1. Photometric Requirements.

Minimum Intensity (candelas) (a)				
Type	Color	0-6 deg	6-9 deg	9-14 deg
L-863	White	14.5	7.2	3.6
(except	Yellow	6.2	3.1	1.5
L-863E)	Green	6.2	3.1	1.5
	Red	1.8	0.9	0.4
	Blue	1.4	0.7	0.3
(a) Angles measured in vertical plane.				

3.3.2 L-863E Light Unit.

The light unit must have a flash rate of 60 to 80 flashes per minute (fpm) and must meet the minimum photometric requirement of a 20 cd effective intensity in white light with a beam pattern of 10° degrees vertical by 30° horizontal.

NOTE: *The effective intensity of a flashing light is equal to the intensity of a steady-burning (fixed) light of the same color that produces the same visual range under identical conditions of observation.*

3.4 Electrical.

All current carrying parts of the light units must be rated for the service intended.

3.4.1 Non-rechargeable Batteries.

Non-rechargeable batteries must be of a readily available type from multiple sources that will operate the L-863W, L-863W/Y, L-863R/G, , L-863Y, L-863R, L-863G, and L-863B lights for a minimum of 72 hours and the L-863E lights for a minimum of 24 hours, while maintaining the photometric requirements in paragraph 3.3.

3.4.2 Rechargeable Batteries.

- Rechargeable batteries must be of a readily available type that will power the light fixtures on a full charge for a minimum of 8 hours, while maintaining the photometric requirements contained in paragraph 3.3.

- b. Fixtures designed to use rechargeable batteries must be equipped with voltage monitoring to prevent excessive battery depletion.

3.4.2.1 Battery Operation after Recharge.

- a. Following operation for at least 8 hours, the batteries must be capable of being charged sufficiently, within a maximum of 13 hours, to power the fixtures for a minimum of 8 hours.
- b. The batteries must be able to withstand at least 30 total charge/discharge cycles.

3.4.2.2 Solar Charged Batteries.

Solar charged batteries must be of a type that allows for a minimum equivalent peak of 3 sun hours to maintain operation at full intensity level and 1.5 sun hours in flashing mode. They must be capable of powering the lighting units for a minimum of 8 hours of operation.

3.4.3 Lamp.

- a. The lamp used with the L-863W, L-863W/Y, L-863R/G, L-863Y, L-863R, L-863G, and L-863B units must have a rated life of at least 1000 hours.
- b. The L-863E lamp must have a rated life of at least 1,500 hours when flashed at the required rate of 60 to 80 fpm.
- c. Power to the lamp must be controlled by an externally operated switch that meets all the environmental requirements in Section 3.2 of this specification.

3.4.4 Alternative Lighting Devices (ALD).

- a. ALD portable runway lights are lighted fixtures that use a light source other than incandescent or xenon lamps, (i.e., Light Emitting Diodes (LEDs), halogen, cold cathode, etc.).
- b. ALD lights must meet all the specifications and requirements for portable runway and taxiway lights in this document.
- c. If multiple light devices to produce a single light source are used, the design must ensure the unit meets the light output specification in Table 1. The unit must discontinue operation if at least 25% of the light devices fail per *Engineering Brief #26*.
- d. L-863E light units that use ALD must have all testing conducted in the flashing mode.
- e. Power to the ALD must be controlled by an externally operated switch that meets all the environmental requirements in Section 3.2 of this specification.

3.5 Optical System.

- a. The optical system must consist of a transparent outer cover and may include reflectors and shields.
- b. The cover may be either glass or plastic conforming to MIL-C-7989B, Amendment 2, dated 8 September 1982.

- c. For units with a replaceable in-field light source, the cover must be designed to be easily removed and replaced and retain correct alignment after replacement.
- d. Reflectors, if used, may be plastic, stainless steel, or aluminum with a specular finish.

3.6 Housing.

- a. The housing must be fabricated from high-impact plastic, nonferrous metal, or from ferrous metal suitably protected against corrosion.
- b. Copper bearing hardware in contact with aluminum must be cadmium, nickel, or zinc plated.
- c. Housings must have sufficient strength and rigidity to support the battery and withstand normal handling.
- d. Joints between metal and glass must be sealed by watertight gaskets that conform to all the environmental requirements in Section 3.2 of this specification.
- e. The bottom surface of the housing must allow the light unit to remain in a stable upright operating position when the light unit is placed on a flat surface.
- f. The installed height above ground must not exceed 14 inches (35 cm) for Type L-863W, L-863W/Y, L-863R/G, L-863Y, L-863R, L-863G, and L-863B fixtures, and 24 inches (60 cm) for the Type L-863E fixture. This height must include the battery housing, anchoring provisions, and any other attachments.
- g. The color of all external non-light transmitting surfaces, with the exception of external hardware, must be yellow.

3.7 Radio Control.

The manufacturer may provide an optional radio controlled system which would allow the remote operation of the lighting equipment. The radio receiver must then meet the following section in 47 CFR, part 15:

- a. Section 15.109, Radiated emission limits.
- b. Section 15.111, Antenna power conduction limits for receivers.
- c. Additionally, the receiver must meet the following requirements:
 - (1) Frequency: the receiver must operate at a single frequency between 118-137 Megahertz (MHz) and process amplitude modulated (AM) signals.
 - (2) **NOTE:** *If the receiver operating frequency is not field selectable, the frequency must be specified by the customer before shipment from the manufacturer.*
 - (3) Frequency tolerance: must be ± 0.003 percent (30 parts per million (ppm) of the carrier center frequency.

- (4) Receiver sensitivity: must be 5 microvolts (μV) or less for a 10 decibel (dB) signal plus noise to noise ratio $((S+N)/N)$. The manufacturer must provide a sensitivity adjustment.
- (5) Receiver selectivity: must be a bandwidth of not less than ± 9.0 kilohertz (kHz) from the assigned carrier frequency at 6 decibels below carrier (dBc) and not more than ± 40 kHz at 60 dBc.
- (6) Fidelity: The receiver output must be flat within ± 2.0 dB from 300-2450 Hz.
- (7) Nominal antenna impedance: at operating frequency, must be 50 ohms unbalanced.
- (8) Audio output: 0 decibels referenced to 1.0 milliwatt (dBm) or more into a 600 ohm load with signal input of 5 μV modulated 30 percent at 1000 Hz. Pulses resulting from bursts of radio frequency energy (clicks of an aircraft transmitter microphone) must drive the decoder when the receiver input signal is 5 μV minimum.

3.8 Anchoring Provision.

The L-863W, L-863W/Y, L-863R/G, L-863Y, L-863R, L-863G, and L-863B units must be equipped with an anchor or provision for an anchor, to be supplied by the purchaser, to ensure that the light unit remains in its intended upright position when placed in its operating environment.

3.9 Instruction Sheet.

- a. The instruction sheet must contain a complete parts list, battery requirements, and anchoring instructions. Sufficient illustrations or drawings must be included to clearly indicate the anchoring procedure.
- b. The anchoring instructions must not allow the installation of the fixture to exceed the as-installed above ground heights specified in paragraph 3.6.

3.10 Label.

A label must be affixed to the housing and contain the following information:

Portable Runway/Taxiway Light
Identification: FAA L-_____
Voltage _____ Wattage _____
Manufacturer's Part No. _____
Manufacturer's Name or Trademark _____

4. EQUIPMENT QUALIFICATION REQUIREMENTS.

4.1 Qualification Certification Procedures.

Procedures for certifying equipment to be furnished under the Federal grant assistance program for airports are contained in AC 150/5345-53, *Airport Lighting Equipment Certification Program*, current edition.

4.2 Warranty.

The manufacturer must agree to provide each customer with the following warranty:

This product is manufactured per the specifications in AC 150/5345-50. Any defect in material or workmanship which may develop during normal use for 90 days after installation will be corrected by the manufacturer.

4.3 Certification Tests.

The following tests must be performed on each unit submitted for certification to demonstrate compliance with this specification. The failure of any tests will be cause for rejection of the equipment.

4.3.1 Inspection.

The equipment must be inspected for conformance to all design requirements in this specification.

4.3.2 Photometric Test.

- a. Before testing, photometric test equipment must be calibrated per Section 6.0 *Test Procedures and Measurements* of IES LM-35-02, *Photometric Testing of Floodlights Using High Intensity Discharge or Incandescent Filament Lamps*.
 - (1) The photometric axes are established in relation to a properly installed unit.
 - (2) The vertical axis runs through the center of the unit and is perpendicular to the ground plane.
- b. The resultant isocandela curves may be shifted a maximum of one degree horizontally or vertically to achieve compliance with the specified photometric curve.
- c. The optical performance of the light units must be determined by photometric readings taken with the lens, lamp, and battery(s) furnished with the light unit.

4.3.2.1 Photometric Test Method for Omni-directional Units.

- a. Photometric measurements must be taken in one degree increments along each vertical axis, within the limits of Table 1.
- b. The vertical beam spread must be measured at least every 30 degrees of the horizontal beam width. Each reading must meet the minimum intensity requirement.

4.3.2.2 Photometric Test Method for Bi-directional Units.

- a. Photometric measurements must be taken in one degree increments along each vertical axis, within the limits of Table 1.
- b. The vertical beam spread must be measured at least every 30 degrees of the horizontal beam width. Each reading must meet the minimum intensity requirement.

- c. The horizontal beam spread must be measured at least every one degree cut of the vertical beam width.

4.3.2.3 Photometric Test Method for Flashing Light Units.

The effective intensity for flashing lights shall be calculated in accordance with the following formula by the method described for "Flashing Light Signals" in the IES Handbook, *1993 Reference and Application Volume* 8th Edition, Page 96 and 97:

$$I_e = \left(\int_{t_1}^{t_2} I dt \right) / (0.2 + (t_2 - t_1))$$

Where:

I_e = Effective intensity (Candela)

I = Instantaneous intensity (Candela)

t_1, t_2 = Times in seconds of the beginning and end of that part of the flash when the value of I exceeds I_e . This choice of the times maximizes the value of I_e .

4.3.2.4 Unit with a Non-Rechargeable Battery.

The photometric measurements contained in paragraph 4.3.2.1 must be taken during the last hour of operation.

4.3.2.5 Unit with a Rechargeable Battery.

The photometric measurements in paragraph 4.3.2.1 must be taken during the last hour of operation per paragraph 3.4.2.1.

4.3.2.6 Chromaticity.

Each fixture must be tested with each type of filter, lamp, and optical system to be used in the equipment to ensure that it meets the CIE chromaticity requirements per ICAO, Annex 14, Appendix 1, Section 2, *Colours for aeronautical ground lights*.

4.3.3 Wind Test.

The manufacturer must prove, either by actual wind tests or calculations, that the light units will remain in place and not be damaged when anchored per the manufacturer's instruction sheet and subjected to a wind speed of 150 mph (240 km/h) from any direction.

4.3.4 Low Temperature Test.

- a. The lighting unit must be placed in a test chamber at ambient temperature, and then operated to determine readiness for testing.
- b. After successful readiness testing, the temperature of the test chamber must be lowered to -4°F (-20°C) with the ac power off.
- c. The equipment must be temperature soaked for 12 hours with any optional equipment attached.

- d. At the conclusion of the 12 hour cold temperature soak, the equipment must be energized and operated in the test chamber at the soak temperature for 4 hours. Optional equipment must be demonstrated following the operational test.
- e. If the lighting unit fails to operate within 3.5 minutes, it is considered to have failed the test and is cause for rejection.
- f. Failure of the lighting units to start and operate at their rated intensities is considered a failed test and cause for rejection.
- g. Any deterioration or failure of components will be considered as a failed test and cause for rejection.

4.3.5 High Temperature Test.

- a. The lighting unit must be placed in a test chamber at ambient temperature, and then operated to determine readiness for testing.
- b. After successful readiness testing, the temperature of the test chamber must be raised to 122°F (50°C) with the lighting system power off.
- c. The equipment must be subjected to 122°F (50°C) for 12 hours with optional equipment attached.
- d. After being subjected to 12 hours in the test chamber at 122°F (50°C), the light unit must be energized and operated at 122°F (50°C) for 4 hours. Optional equipment included with the light unit must be demonstrated to insure its operability following the operational test.
- e. If the lighting unit fails to operate within 2.5 minutes, it is considered to have failed the test and is cause for rejection.
- f. Failure of the lighting unit to start and operate at their rated intensities is considered a failed test and cause for rejection.
- g. Any deterioration or failure of components will be considered as a failed test and cause for rejection.

4.3.6 Rain Test. A rain test must be conducted in accordance with MIL-STD-810F, Method 506.4, paragraph 4.4.2, Procedure I, with a rain rate of 5.2 inches/hr (13 cm/hr). The test duration must be 30 minutes per side. Any leakage of water into the lamp body or failure of the fixture to operate must be cause for rejection.

4.3.7 Solar Radiation Test. A sunshine test must be conducted in accordance with MIL-STD-810F, Method 505.4, paragraph 4.4.3, Procedure II for all light fixtures with nonmetallic exterior parts. The material must be subjected to a minimum of 56 cycles. The test unit must operate and perform all specified functions after this test. Any evidence of deterioration or alteration of the light fixture must be cause for rejection. For plastic optical lenses or covers, the photometric performance must be measured after this test.

4.3.8 Salt Fog Test. If the fixture has external metal components, a salt-fog test must be conducted on the assembled light fixture in accordance with MIL-STD-810F, Method 509.4, paragraph 4.5.2,

Procedure. The test duration must be 48 hours exposure and 48 hours drying. Any evidence of damage, rust, pitting, or corrosion (except for sacrificial coatings) must be cause for rejection.

4.3.9 Visual Examination. The portable lighting equipment must be examined for compliance with the requirements on materials, finish, and quality of workmanship.

4.3.10 Electromagnetic Interference Tests.

- a. The portable lighting equipment must be in its normal operating configuration.
- b. Portable lighting equipment must be tested and not exceed the radiated emission limits per Title 47, Subpart B, Section 15.109b for the following limits at 33 feet (10 meters):

Table 2. Radiated Emission Limits.

Frequency of Emission (MHz)	Field Strength (microvolts per meter)
30-88	90
88-216	150
217-960	210
above 960	300

- c. Portable lighting equipment must be tested per Title 47, Subpart B, Section 15.111. With the receiver antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal at any frequency within the range of measurements specified in Section 15.33 (unintentional radiator) must not exceed 2.0 nanowatts.
- d. If the equipment does not meet the requirements and emission limits in paragraph 4.3.10b and c, the manufacturer must be informed that there is potential for harmful interference with the operation of FAA or other airport equipment.

4.3.11 Weight.

The complete lighting unit shall not exceed 35 lb (16 kg) per HF-STD-001.

5. PRODUCTION TESTS.

5.1 System Production Tests.

A visual examination must be performed for all components to verify proper materials, finish, and quality of workmanship. Each unit must be energized and tested to verify specified operation and conformance to photometric requirements.

5.2 Light Unit Production Tests.

All light units must be visually examined for proper materials and assembly. The manufacturer must demonstrate that the on-going production photometric test results show the manufacturing process has

statistical capability conforming to light unit photometric requirements as specified in Table 1 for 0-6 degrees vertical.

5.3 Production Operational Test.

All light units must be tested for intensity after a 15 minute initial turn on and then after one hour of operation.

5.4 Production Test Records.

Records showing actual test results of all tests required by section 5.2 and 5.3 must be maintained for a period of three years by the manufacturer. These records must be traceable to the units tested by serial number.